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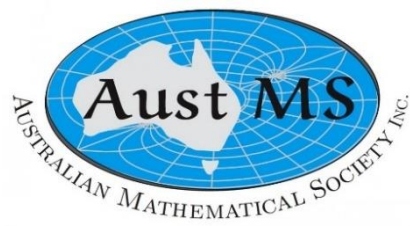
# AMSI-FUNDED WORKSHOPS

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JULY 2019 – JUNE 2020

REPORT

**AMSI would like to thank the following partners for their support:**



# AMSI-FUNDED WORKSHOPS

July 2019 – June 2020

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# FOREWORD

AMSI provides funding for research-based mathematical and statistical events held by staff and students at AMSI Member institutions. Two joint workshop funding rounds are held yearly in partnership with the Australian Mathematical Society (AustMS). These funding rounds provide a streamlined process that only requires one application to request support from both AMSI and AustMS. Different levels of funding are available for small events (a budget of less than \$10,000) and large events (a budget of over \$10,000). AMSI funding may be used for both speaker support and discretionary event costs.

In 2019, AMSI was proud to enter into an additional partnership with the Sydney Mathematical Research Institute (SMRI) to bring international conference and workshop speakers to Australia for events in 2020 and beyond. Organisers can nominate an international speaker to visit SMRI for one week pre- or post-event. SMRI provides the approved speaker with return international flights, domestic flights and up to one week's accommodation in Sydney during their visit to SMRI.

In the period of 1 July 2019 – 30 June 2020, AMSI provided funding to 16 events. Held all over Australia, these events covered pure and applied disciplines including disease modelling, high-performance computing, emergency management and representation theory.

The AMSI workshop funding program aims to strengthen Australia's research capabilities by encouraging local and international collaboration. Each successful funding application must be proven to be of national benefit. Diversity is a core value of the program and organisers are required to actively encourage the participation of women and early-career researchers.

The program aligns with the project objectives of the Securing Australia's Mathematical Workforce: 2016–2020 agreement between AMSI and the Department of Education to:

- Strengthen research training and the work-readiness of advanced mathematical sciences graduates
- Promote university-industry collaborations that will encourage the private sector employment of mathematical sciences graduates
- Attract and improve the retention of senior undergraduate students in the mathematical sciences, with particular attention to women and Aboriginal and Torres Strait Islander students

# COMMITTEE CHAIR'S REPORT

Since its inception 18 years ago, AMSI has provided important national benefits in research support along with its broad activities in education and industry outreach. The mathematical sciences in Australia are much more productive because of this.

Even with a modest budget over the last financial year, AMSI has supported a pleasing variety of research topics. Four of the supported workshops have titles that relate directly to the growth areas of biomedical sciences and ecology. Three of the workshops related directly to the growth area of data analysis. Others relate to the foundational disciplines of mathematical structures and mathematical physics. As well as supporting local workshops, AMSI can display its banner on regular international congresses when they occasionally operate in Australia. For example, the International Conference on Indian Ocean Meteorology & Oceanography, held in Perth in February 2020, was one of the last international conferences to be held before the pandemic lock-down. Hundreds of international delegates attended under the banner of AMSI, where Australian science was on full display.

The AMSI Scientific Advisory Committee (SAC) consists of top mathematical scientists from around the world, including a Fields Medallist and several members of national academies. We are grateful that they agree to serve voluntarily on this committee because they understand the importance of stimulating mathematical and statistical research in Australia.

The workshops that are summarised in this report, were highly successful in terms of scientific quality and in terms of the numbers and demographic spreads of delegates. I am grateful for the support of the government and of our member institutions, and for our volunteer conference organisers.

**Philip Broadbridge,  
Chair, Scientific Advisory Committee**

# WORKSHOPS



## Workshop for Women in Computational Topology (WinCompTop) 2

1–5 July 2019

Hosted by the Australian National University

The workshop facilitated the formation of new and lasting research collaborations between junior and senior researchers working in the field of computational topology. The majority of the time at the workshop was spent tackling open problems in small working groups headed by established leaders in the field. There was also an open day (with no gender restrictions) containing colloquium-style talks and a poster session.

Goals included helping promote research by women and improve retention rates. These goals were met through the celebration and promotion of research by women and gender diverse researchers on the open day, and the progress of research, and establishing and strengthening research collaborations through the working groups. This workshop brought together women in computational topology, offering networking and research opportunities.

The promotion of research by female mathematicians at the open day and through the public lecture helped increase the visibility in the field and break down stereotypical images of what a mathematician looks like. The open day had a poster session enabling PhD students and early-career researchers to present their research. Each of the four working groups made progress towards a longer-term collaborative project. Each group has continued working on their project together after the conclusion of the workshop and expects that within 18 months a paper will be produced by the group on work started in the workshop. This will be submitted to the peer-reviewed proceedings volume for the conference. Some of the groups are applying for future collaboration meetups such as through SWiM at MSRI.

The research themes focused on the four distinct projects within computational topology: theory and application of topology to neural codes; computation and theory of multiparameter persistence; theory and applications of motives in directed graphs; and theory and computation of Morse theory in image analysis.

42 attendees (17 domestic, 32 female)  
4 AMSI Member institutions represented  
6 speakers (3 international, 6 female)  
7 domestic postgraduates and ECRs

*I very much enjoyed the working group experience. It was great to get to learn something new, and the group leader was fantastic.*

**Joan Licata (ANU)**



## Data-Informed Mathematical Models of Infectious Diseases

1–12 July 2019

Hosted by the University of Melbourne at MATRIX

With the ever-growing emphasis on the importance of sound evidence in healthcare decision-making and policy, the power of data-informed mathematical models to provide much needed insight is substantial. For conclusions drawn from a mathematical model to be reliable, it is essential for unknown model parameters to be estimated from data in a statistically sound manner and to account for uncertainty in the parameter values. This MATRIX-hosted workshop brought together local and international experts in this area to discuss the use of existing statistical methods and showcase new methods for parameter estimation in models of infectious diseases.

This workshop addressed the need to use existing statistical methods and to develop new methods for parameter estimation in models of infectious diseases. It brought together experts in the areas of mathematical epidemiology and statistical inference to make progress on a significant research and public health problem. Interest has been growing, both nationally and internationally, in developing new methods for parameter estimation in mathematical models of infectious diseases, which makes this a timely workshop. The techniques showcased at this workshop will be helpful to foster new and existing collaborations, which may lead to future funding applications.

There are several publications that are planned from the workshop, including “Developments and Challenges in Data-Informed Mathematical Models for Policy”, “Identifiability and Utility in Disease Models” and “Making Use of Structured Priors”.

The research themes were: using prior knowledge to improve inference and forecasting of infectious disease transmission; integrating multiple data sources in infectious disease modelling; and fitting complex models: identifying the problems and the solutions.

23	attendees (18 domestic, 10 female)
4	AMSI Member institutions represented
11	speakers (4 international, 5 female)
6	domestic postgraduates and ECRs

*The MATRIX workshop provided great opportunities for interdisciplinary collaboration. Statisticians, mathematicians and practitioners sat in the same room, brought their expertise from different disciplines to find solutions for an important problem.*

**Carla Ewels (James Cook University)**

## Flags, Galleries and Reflection Groups

5–9 August 2019

Hosted by the University of Sydney

This workshop brought together Australian and international researchers in algebraic combinatorics, algebraic geometry, representation theory and geometric group theory, to explore new interactions between these fields in the study of fundamental mathematical objects including flags, galleries and reflection groups. The invited speakers included some of the most distinguished researchers in these fields, as well as several stellar early- and mid-career mathematicians.

Invited speakers included international leaders in a range of fields. It was wonderful to give local researchers the opportunity to hear about recent progress and interact informally with researchers of this calibre, while the contributed talks were a valuable opportunity for Australian students and early-career researchers to showcase their work. Several of the invited speakers extended their stay in Australia in order to collaborate with local researchers, thus increasing the national benefit of the conference. Many exciting results were announced during the talks, sparking intense questions and discussions during the breaks. It was gratifying to see the connections between the different areas of mathematics represented at the conference emerging from talks during the week, and to observe participants from different areas (mathematical and geographic) starting to interact as a result. Several collaborations began during the conference week.

Research themes covered were flags, some of the most fundamental objects in mathematics (classical buildings are geometric realisations of certain flag varieties, while flag varieties are also studied via their cohomology, which allows the use of combinatorial techniques); combinatorial models for algebraic structures (such models include crystals and folded galleries); and Coxeter groups (these generalise classical reflection groups, and have fundamental importance in algebra).

56	attendees (28 domestic, 19 female)
4	AMSI Member institutions represented
19	speakers (13 international, 9 female)
10	postgraduates and ECRs

*This was a very enjoyable and useful workshop with an impressive lineup of talks by international and Australian speakers*

**Anthony Henderson (University of Sydney)**

## Challenges in High-Performance Computing (HPC)

2–6 September 2019

Hosted by the Mathematical Sciences Institute, ANU

Scientific computing is often termed as the 'third way to do science', alongside theory and experiments. The focus of the workshop was to investigate the current challenges of solving large scale problems on high performance computers.

The workshop was part of the Special Year on Computational Mathematics celebrated in 2019 by the Australian National University's Mathematical Sciences Institute.

This workshop brought together the multidisciplinary components necessary to meet the grand challenge of the increasing volume of complex computing. The organisers achieved these goals by inviting eminent speakers from the five areas of algorithms, applications, middleware, resilience and software. Each of these speakers gave high-quality talks in the mornings, introducing the participants to their areas of expertise, while more specialised talks were given in the afternoons. The panel sessions designed to encourage interaction between the participants with different backgrounds flowed smoothly and allowed for a more informed insight into future directions than would normally be obtained in highly focused conferences. The strong student participation also meant that future generations will be better prepared for the challenges of software development in the scientific computing framework. To the best of the organiser's knowledge, this is the first event to be held in Australia that has been aimed at bringing a cross-disciplinary group together to foster communication within the high-performance community.

The themes for the conference covered the general areas of algorithms, applications, middleware, resilience and software. The themes were deliberately designed to cover a broad range of topics to encourage communication across these different fields. The research areas of the participants included pure and applied mathematics, computer science and physics.

43	attendees (38 domestic, 8 female)
5	AMSI Member institutions represented
7	speakers (3 international, 2 female)
12	domestic postgraduates and ECRs

*There was plenty of opportunity to interact with leading local and international researchers and I gained new insights into current challenges facing HPC research.*

**Judith Bunder (University of Adelaide)**

## Mathematics of Physiological Rhythms

6–8 September 2019

Hosted by Deakin University

Insomnia, diabetes, mental health, heart illnesses and ageing are widely spread in our society and cost significant amounts to government and health organisations to manage and treat. Mathematical models are becoming very powerful and enable insights in the regulation mechanisms and evolution of the physiological conditions underlying the disease. The workshop brought together world leaders in different stages of their careers in the application of dynamical systems to physiology in order to share emerging trends and new modelling techniques.

The keynote talks were of very high quality with the latest results in each theme: sleep, brain, diabetes and network physiology. The last theme, network physiology, was overarching for the remaining three and focused on the connectivity and dynamics between different physiological systems in the human organism. The open discussion was very lively and among other things discussed the open problem about large parameter spaces and evaluation of mathematical models with large number of parameters.

New interactions occurred between Australian researchers and the four international participants. These continued during the following MATRIX research retreat and became new research collaborations.

The workshop addressed the main problems in dynamical systems applied to physiology research, grouped into themes of sleep, brain, diabetes and network physiology.

31	attendees (27 domestic, 10 female)
7	AMSI Member institutions represented
24	speakers (7 international, 7 female)
16	domestic postgraduates and ECRs

*“The workshop was very well-organised and the topics were very interesting, specially the inter-disciplinary aspects and overlap of techniques. It was very useful for my research topic.”*

**Timothy McLennan-Smith (UNSW Canberra)**

## Analysis on Manifolds

30 September – 4 October 2019

Hosted by the University of Adelaide

The workshop brought together distinguished researchers working on a variety of topics in topology, geometry, analysis and physics, all of whom have made fundamental contributions to analysis on manifolds. This established new significant connections between the featured areas and fostered new international collaborations, benefiting the field in the longer term.

The meeting provided significant national benefit for several reasons. Firstly, it was an important chance for Australian researchers to interact with international experts, thereby further intertwining Australia with the international science community. On the other hand, with Australia already having many strong researchers in the field, the workshop was a chance to showcase the work of leading Australian mathematicians. Moreover, the event was a valuable opportunity for early-career Australian researchers to interact with current leaders in the field, discuss and share their research. The talks had an extremely high quality and were very well received, judging by the active question rounds after the talks and the positive feedback. Another highlight of the conference was the conference dinner which provided a great opportunity to connect in an informal atmosphere and to celebrate the successful conference.

The key research topics discussed at the conference were partial differential equations; (geometric) analysis, in particular harmonic analysis; differential geometry; K-theory; operator algebras and noncommutative geometry; mathematical physics. Index theory provided connections of these different areas to analysis on manifolds, the main theme of this conference.

30	attendees (23 domestic, 6 female)
8	AMSI Member institutions represented
15	speakers (7 international, 5 female)
14	domestic postgraduates and ECRs

*I think the workshop was a great success. The lineup of domestic and international speakers and participants was very good, from talented students to world-leading experts.*

**Peter Hochs (University of Adelaide)**

## Optimisation Methods in Wildfire Emergency Management

11 November 2019

Hosted by RMIT University

Mathematical and, in particular, optimisation models are of high interest in wildfire emergency management, especially for optimal/guided and sustainable decision-making. Major mathematical challenges appear in this context for preparedness, initial attack and mitigation if impacts. Two main features of problems arising in the context of emergency management are the high uncertainty of data and the need of efficiency to save lives and goods. Legal and specific organisational constraints in the decision chain also induce constraints that contribute to the difficulty of the resulting optimisation problems.

This workshop was primary dedicated to young researchers in this domain. It was followed by the international conference organised by the European H2020 GEOSAFE RISE project (2016-2020) on this topic with the opportunity to interact with Australian and international experts. The thematic of the workshop is of high importance for Australia and, unfortunately, the fire season just after the workshop was a sad illustration. The workshop was an effective forum of exchange about mathematical models, in particular optimisation, used in emergency management and how research teams in mathematics can address the main needs of the final users. The attendance was diverse with both academics and final users, which allowed fruitful exchanges about future challenges. There was very significant participation from overseas. It was an excellent opportunity to demonstrate the strengths of Australian teams in this topic and facilitated exchanges for future collaborations.

Research themes covered were mathematical modelling in bushfire management; decision analysis for emergency management; optimisation with uncertainty; robust optimisation; online algorithms; integer linear programming; heuristics; geospatial data analysis; simulation; logistics; evacuation models; and vehicle routing.

41	attendees (17 domestic, 15 female)
6	AMSI Member institutions represented
5	speakers (3 international, 2 female)
6	domestic postgraduates and ECRs

*[I was] impressed by the quality of the presentations by the young researchers*

**Professor Luc Doyen (French National Centre for Scientific Research)**

## Workshop on Stochastic and Algebraic Models for Genome Evolution

20 November 2019

Hosted by the University of Tasmania

In conjunction with the 11<sup>th</sup> annual Phylomania Theoretical Phylogenetics Meeting, this special one-day workshop on Stochastic & Algebraic Models for Genome Evolution was held to build on Australia's emerging strength in mathematical evolution.

It was particularly pleasing to have contributed talks from eight different AMSI Member universities from around Australia. Australia is starting to create a critical mass of researchers in the area of mathematics applied to the study of evolution. Phylogenetic methods underpin many important areas of biological and ecological research from conservation management (as per Professor Mike Steel's talk on phylogeny-based indices of species diversity) to epidemiology (as per Professor Allan Rodrigo's talk on rapid methods of phylogenetic inference for the real-time study of outbreaks). The three keynote talks were all very stimulating and each of them seem likely to lead to either ongoing collaborative research efforts or to spark new topics of research.

Nadia's talk on gene tree species tree reconciliation methods provoked the stochastic modelling group at the University of Tasmania to think about how current models of duplicate gene retention could be incorporated into a species tree framework. Seth's talk on identifiability gave a novel solution method for problems that had previously been attacked in a different way by Dr Jeremy Sumner—he plans to offer an honours project next year that looks at applying some of these techniques. Sophie's talk on Markovian Binary Trees caught the interest of both Associate Professor Malgorzata O'Reilly and overseas visitor David Liberles and they plan to collaborate on applying MBTs to gene tree duplication scenarios.

The research themes were algebraic biology; stochastic modelling; algorithms and combinatoric structure of gene order and gene content models; and biological applications of models.

48 attendees (40 domestic, 14 female)  
8 AMSI Member institutions represented  
9 speakers (3 international, 4 female)  
15 domestic postgraduates and ECRs

*A great community of people working at the cutting edge of a range of creative new ways to bring mathematics to evolution, brought together with people grappling with developing methods for use on very applied biological problems.*

**Andrew Francis (Western Sydney University)**

## Sensitivity Analysis and Uncertainty Quantification Workshop

25–29 November 2019

Hosted by the Australian National University

Quantifying modelling uncertainty is essential for credible simulation-aided knowledge discovery, prediction and design. This workshop brought together a diverse set of researchers to identify challenges and novel research directions in the field of uncertainty quantification (UQ). Talks focused on both algorithm development and applications of UQ in areas ranging from aerospace, material and electrical engineering to the environment. The focus was on various issues surrounding high-dimensional parameter spaces, multi-fidelity modelling, parameter inference, optimal experimental design, and design under uncertainty. This workshop was part of the 2019 ANU Mathematical Sciences Institute special year in Computational Mathematics.

The invited speakers and attendees were selected specifically to facilitate collaboration between Australian and leading international researchers to address Australia's science and research priorities in the areas of Environmental Change, Advanced Manufacturing, Energy, and Soil and Water. The field of uncertainty quantification is providing transformative mathematical and numerical methods for improving the ability to make decisions under uncertainty which is essential for all quantitative disciplines. The workshop was particularly successful in bringing together leading academics in the UQ area with practitioners from CSIRO, DSTG, Geoscience Australia, BoM, ABARES who work on very complex applications.

The structure of the workshop facilitated the collaboration between attendees. The number of talks was restricted to 20, with generous amounts of time and facilities (break spaces) for collaboration. Numerous attendees commented on their ability to discuss and collaborate at this workshop.

Research themes covered were multivariate function approximation; multi-fidelity sampling and approximation; inverse problems; design under uncertainty; and applications of quantifying certainty.

50 attendees (43 domestic, 9 female)  
10 AMSI Member institutions represented  
8 speakers (3 international, 4 female)  
10 domestic postgraduates and ECRs

*Thanks for putting together such a wonderful workshop. Felt that I got much smarter after the workshop :-)*

**Thong Quoc Le Gia (UNSW)**



## Data Science Down Under Workshop

8–12 December 2019

Hosted by the University of Newcastle

The aim of the workshop was to bring together Australian researchers and practitioners as well as key international academics in areas related to data science, e.g. mathematics, statistics and computer science, to discuss recent advancements, share ideas and foster new local and international collaborations.

The local attendees of the workshop were from all over Australia, had diverse academic backgrounds, and came from a wide range of career stages. The make-up of the workshop was pleasantly balanced between students, both undergraduate and postgraduate, ECRs and senior academics. The workshop had great female representation, both in terms of speakers and attendees. We also had the pleasure of hosting students from minority groups many of whom were given the opportunity of presenting the results of their research during the workshop. The workshop started with a boot-camp containing a crash-course on randomised numerical linear algebra presented by the pioneers of the field. The attendees were all unanimous in that the materials of the boot-camp contained valuable concepts and ideas, which is useful in all research areas represented at the workshop. Already, several attendees are planning on incorporating ideas from the boot-camp into their research agendas. The talks covered a diverse and broad spectrum of topics in data science, which has spawned several collaborations. Several attendees have already planned on visiting each other for research collaborations in the future. It was also suggested to organise a similar event next year with a boot-camp on randomised methods in optimisation.

The research themes were randomised numerical linear algebra; computational mathematics; applied probability; high-dimensional statistics; optimisation; image processing; random matrix theory; time series analysis.

53 attendees (45 domestic, 9 female)  
12 AMSI Member institutions represented  
13 speakers (5 international, 5 female)  
16 domestic postgraduates and ECRs

*DSDU was an excellent event: it was well-organized [sic], attracted a number of leading experts, and allowed for the meaningful exchange of ideas. I look forward to the next event organized by this group!*

**Assistant Prof. Vivak Patel (University of Wisconsin—Madison)**

## Finite Geometry: A Workshop in Honour of Tim Penttila

16–17 December 2019

Hosted by the University of Adelaide

Professor Tim Penttila holds a special place in finite geometry and has worked in its many diverse areas. If it were not for his work on hyperovals (for example), this now prominent research area would not have its status today. One of Tim's key attributes has been his continual support of women in mathematics, and this was evinced by his list of collaborators and students, the number of female participants in this workshop, and the many tributes to Tim and his mentorship. By its very nature, research in finite geometry is driven by open problems that are 'easy to state' though stubbornly difficult to solve. The specific research directions that this workshop fostered included both the desire to come closer to a solution to famous open problems in the area, but also in problems that connect to other areas. The workshop sparked new research collaborations between Australian research and researchers from other countries.

There were many vibrant research discussions between the participants, and new collaborations were forged. Two examples are: Dr Van de Voorde and Dr Hui are currently discussing a grant proposal; and Dr Barwick has been invited to visit the University of Canterbury and collaborate with Dr Van de Voorde and Dibyayoti Jena. Dr Bamberg and Dr Ihringer initiated interesting research investigations with Dr Gilliespie. It was also excellent to see Drs Bishnoi, Ihringer and Pepe continuing their fruitful recent collaboration and discussing extensions to their recent work.

The key research theme was finite geometry, with aims to come closer to a solution to famous open problems in the area, but also in problems that connect to other areas. The workshop included talks which outlined new techniques which will help work towards solutions, and also illustrated innovative applications to other areas.

32	attendees (23 domestic, 12 female)
5	AMSI Member institutions represented
10	speakers (3 international, 7 female)
6	domestic postgraduates and ECRs

*Congratulations on a great workshop—I thought it was a big success*

**Dr Christine O'Keefe (CSIRO)**

## New Connections in Representation Theory

10–14 February 2020

Hosted by the University of Queensland

With 22 invited speakers and a total budget of \$80,000, this conference was a major international event in representation theory, bringing together both early-career and advanced leading researchers in mathematics. The event strengthened and maintained Australia's position at the forefront of representation theory, through creating a strong inter-generational network within the field, which was one of the primary goals of our conference. This conference hosted both international visitors who are returning to Australia after establishing connections through one of these recent programs, as well as researchers who are visiting Australia for the first time and joining this international community.

The diverse scope of research interests of the invited speakers contributed to a fruitful atmosphere of mathematical connections at the conference, combining forefront research in the study of reductive Lie groups, geometric representation theory, categorification, and affine Lie algebras. One goal was to facilitate a high level of interaction between the participants. To accomplish this, the talks were aimed at a broad audience and included significant background material to encourage questions. In addition, several of the participants have used the opportunity of the conference to stay in Australia longer and have further mathematical discussions and collaborations. A second goal of the conference was to highlight the contributions of female mathematicians in representation theory. The event had a strong female presence, with nine of the speakers and two of the five organisers being women, putting Australia in a leadership position of bridging the gender gap in the field.

The conference was centred around three main themes: representation theory of reductive Lie groups with connections to number theory, geometric representation theory, and the use of geometric techniques to tackle problems in representation theory, and categorification and categorical actions, including the theory of Soergel bimodules.

45	attendees (27 domestic, 15 female)
4	AMSI Member institutions represented
17	speakers (8 international, 6 female)
19	domestic postgraduates and ECRs

*The conference very successfully integrated a number of different perspectives on representation theory, thereby elucidating new connections and potentially facilitating new collaborations.*

**Peter Crooks (Northeastern University)**

## AMOS 2020 International Conference on Indian Ocean Meteorology & Oceanography

10–14 February 2020

Hosted by the Australian Meteorological & Oceanographic Society (AMOS)

This international conference focused on the current research in Indian oceanography and meteorology. Decreases in freshwater supply and recent drought conditions means managing water is an urgent topic. Attracting over 350 participants who made over 430 oral and poster presentations, AMOS2020 combined the AMOS Annual Conference and the International Conference on Indian Ocean Meteorology and Oceanography 2020.

AMOS 2020 included a workshop on cross-cultural communication & climate change which proved engaging and useful for delegates wishing to know more about how to better work with the nation's first people. The conference also featured a “Climate Across the Curriculum” workshop to contribute secondary school lesson plans on climate science to an international repository. As AMOS 2020 coincided with the 2019/2020 bushfires, there was a level of media interest in the AMOS sciences. The AAP, *The Guardian*, Fairfax and CNN sought stories and experts. ABC started the week with a nationwide radio broadcast direct from the conference and continued with interviews of selected speakers throughout the week.

AMOS 2020 had over 40 thematic sessions covering topics in meteorology, oceanography and other climate sciences under the broad themes of weather, ocean processes, atmospheric processes, climate, land surface processes, Antarctic science, climate services and community engagement. It highlighted the current research in Indian oceanography and meteorology, as well as the water resources in Australia.

Delegates from all over Australia and from overseas attended the week-long conference, and it was considered a huge success. The sessions were dynamic and highly topical, discussions were productive, and the networking events provided unique opportunities for collaboration and useful feedback for the participants.

373	attendees (309 domestic, 127 female)
243	AMSI Members
7	Aborigines and Torres Strait Islanders

*I cannot think of a better way to kick off my PhD than attending and presenting at AMOS 2020. It was like switching the light on.*

**Matthew Goodwin (University of Newcastle)**

## **Baxter2020: Frontiers of Integrability**

**11–14 February 2020**

**Hosted by the Australian National University**

Baxter2020: Frontiers in Integrability was a major international meeting to highlight recent developments in the mathematical theory and application of integrability across a broad range of disciplines. In addition to traditional areas of applicability such as classical statistical mechanics, quantum many-body physics and combinatorics, application areas to be emphasised at this conference include new developments in quantum field theory, string theory and condensed matter physics, which are all joining together in a spectacular leap into the future of integrability. This conference also celebrated the 80th birthday of Emeritus Professor Rodney Baxter, a pioneer in the development of integrability and its application in statistical mechanics.

This conference highlighted recent developments in the theory of integrability, including new frontiers in both theory and applications. These applications related to the areas of quantum field theory and condensed matter physics. The conference brought together Australian researchers working in these areas along with key international researchers. This helped to ensure the future of this important area of activity in Australia, thereby maintaining and enhancing Australia's leadership in this area. It also helped to train a new generation of researchers through the participation of higher degree research students and early career researchers. The conference raised the level of participation of women researchers in this field. The conference also included a celebration of the 80th birthday of Rodney Baxter, a groundbreaking contributor to this field since the 1970s. The influence of his mathematical methods and results has been enormous. A number of research collaborations were consolidated and fostered by this event, including 34 talks.

The research themes were discrete integrable systems; the Yang-Baxter equation; integrable lattice models in statistical mechanics, quantum field theory and condensed matter; and Painlevé equations.

<b>51</b>	attendees (28 domestic, 9 female)
<b>6</b>	AMSI Member institutions represented
<b>12</b>	speakers (6 international, 5 female)
<b>11</b>	domestic postgraduates and ECRs

*Baxter2020 was basically the last conference which took place before the world closed down. I am very happy that it happened and I enjoyed the conference (as well as my first visit to Australia) very much.*

**Charlotte Kristjansen (University of Copenhagen)**

## Number Theory Online Conference (NTOC) 2020

3–5 June 2020

Online event hosted by the University of Newcastle

This conference brought together experts in all areas of number theory. It was held online, so instead of being localised geographically, it was localised in a range of time-zones, specifically time-zones near Australia. Thus, the keynote participants came from Australia, New Zealand, Japan, South Korea and Taiwan. A number of participants joined from all over the world.

The conference was held using a combination of Zoom and iSee. The latter platform is an Australian-developed 3D virtual environment where participants can mingle in a natural way between talks, facilitating networking and initiating new collaborations in a way that other video-conferencing platforms like Zoom and Vibe can't match. While much of the socialising did indeed occur in iSee, most speakers chose to present their lectures using Zoom, as this was a more familiar environment for them.

Holding conferences online rather than in person has many benefits. The necessity in the time of Covid-19 is obvious—in-person conferences are currently impossible and will most likely remain impossible or at best inadvisable for the rest of 2020. Furthermore, even after this emergency has passed, we should be holding more events online, as this greatly reduces the financial and environmental impact of academic conference travel.

Most areas of number theory were represented, with an emphasis on topics of interest to the Australian number theory community. The parallel worlds of number theory, i.e. the analogy between number fields and function fields, was a theme that appeared in several of the talks.

68	attendees (27 domestic, 15 female)
8	AMSI Member institutions represented
9	speakers (4 international, 4 female)
13	postgraduates and ECRs

*A superbly run conference, with a wide range of very interesting topics on offer; Florian Breuer did a magnificent job hosting the event, and I learnt about a lot of new mathematics as a result.*

**Daniel Delbourgo (University of Waikato)**

## ISEC2020—International Statistical Ecology Conference

22–26 June 2020

Online event hosted by UNSW

The International Statistical Ecology Conference (ISEC) is a biennial meeting of researchers at the interface between ecology and statistics that has been running since 2008. It is the leading conference at the interface between statistics and ecology, and this was to be the first time it was to be hosted in the southern hemisphere. When the pandemic hit, organisers decided to go virtual, and kept all elements of the original program: plenary speakers, the Skills Showcase (75-minute hands-on tutorials run in parallel training participants in new techniques), short courses, parallel stream contributed talks, speed talks, posters, round-table discussions, even trivia night.

The organisers would have been happy with 300 attendees for a live event but ended up with over 860, including over 130 from low-income countries. Talks were delivered live via Zoom meetings but streamed (via YouTube) to Slack where attendees watched from in the Slack workspace, without the need to leave the conference “venue” and interacted with speakers via emojis and questions in discussion threads attached to each session. There were four parallel sessions in which all talks were recorded so that people could watch later and ask questions later. There were also Slack channels for posters and speed talks (“displayhalls”), round-table discussions, and a large number of channels for networking and socialising, based on research interest, geographic location, or personal interests (e.g. book club!).

The conference was a major success, with several experienced attendees saying that this was the best conference they had ever attended. One of the most exciting features of the virtual format is the capacity for asynchronous as well as synchronous communication—the round-table discussions, which started in a dedicated session on the second day of the conference, continued all week, and led to a journal Special Feature proposal with nine papers, all planning to report ideas generated in discussions held at the conference. Whereas most conferences involve making difficult decisions about which session to attend, in the virtual setting it was possible to attend multiple sessions scheduled simultaneously (most advisably done via watching recordings later) and interacting with speakers from both sessions.

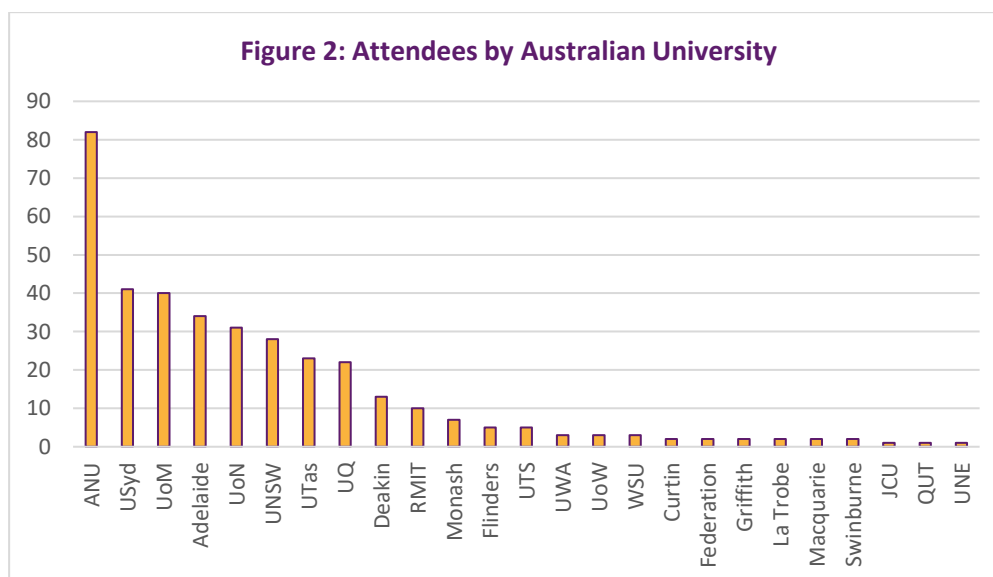
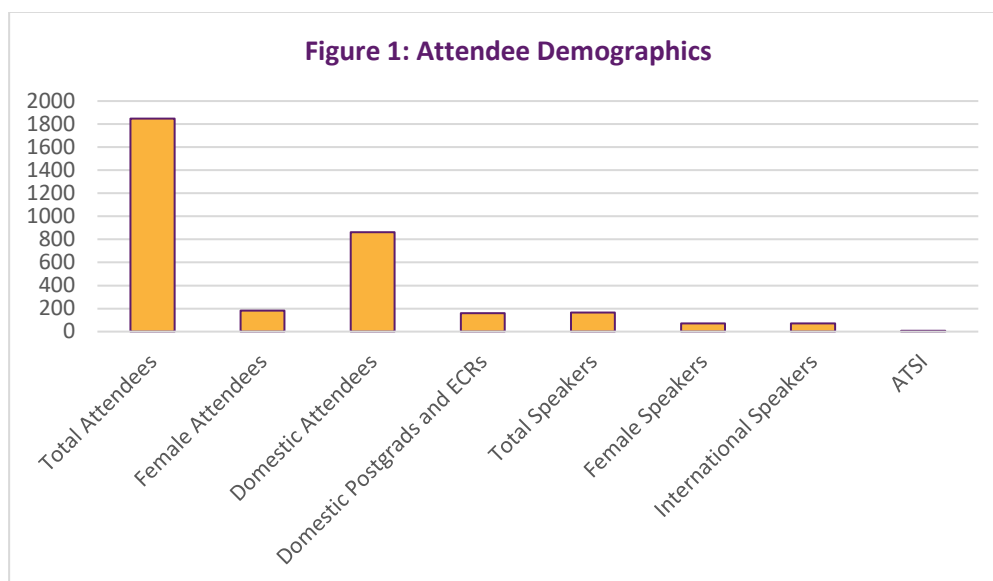
861 total attendees

151 domestic attendees

*When you combine a great community with great organisation you get a superb virtual conference like ISEC2020... I hope some virtual innovations stick around!*

**Andy Seaton (University of St Andrews)**

# PARTICIPATION BREAKDOWN



State	Participants
ACT	109
NSW	105
VIC	76
SA	42
TAS	26
QLD	24
WA	5

Organisation	Participants
University	365
Government	17
Industry	4
Other	4
National Computational Infrastructure	2
QIMR Berghofer Medical Research Institute	1

*NB: Only total, domestic and Aboriginal and Torres Strait Islander (ATSI) attendee figures include AMOS 2020 and ISEC2020. State and organisation tables reflect domestic participants only.*



# SCIENTIFIC ADVISORY COMMITTEE

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- **Professor Lesley Ward**  
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Imperial College London
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Northwestern University
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